Technical Note 13
Altered Hydric Soils

Deliberations of:

National Technical Committee

for Hydric Soils (NTCHS)

Types of Altered Hydric Soils

- Artificial
- Drained (Protected)
- Historic
- Relict
  - The objectives of this lecture are to outline criteria used to identify each of these alterations and to outline the impact of alterations on the hydric status of a soil.

Development of Altered Soils

- Hydrologic modification may result in:
  - 1. Artificial Hydric Soils
  - 2. Drained (Protected) Hydric Soils.
- Soil modification may result in:
  - 1. Artificial Hydric Soils
  - 2. Historic Hydric Soils
  - 3. Relict Hydric Soils

Hydrologic Modification

- Hydrologic modification results where saturation and/or inundation (ponding or flooding) has been changed by human or geologic processes.
- Both geologic modifications and human modifications of hydrology may change the hydric status of a soil.

Soil Modification

- Soil modification results where soils (not hydrology) have been altered either through geologic or human additions or removals.
- Both geologic modifications and human modifications of a soil may change the hydric status of a soil.

Key

- Hydric Soils are currently supporting or capable of supporting wetland ecosystems. Soil modifications are not needed to maintain or restore a wetland. In the case of drained hydric soils, only removal of hydrologic modifications are needed to restore wetlands.
- Nonhydic soils currently are not supporting nor are they capable of supporting wetland ecosystems. Soil modifications are needed to create a wetland. Hydrology modifications may also create a wetland on nonhydric soils. The differences between creation and restoration will be discussed layer.

Review: Why is a Soil Hydric

- **A soil is hydric because it:**
  - 1. Has a hydric soil indicator, or
  - 2. Meets hydric soil criteria 3 or 4, or
  - 3. By data meets the Hydric Soil Technical Standard (HSTS).

Artificial Hydric Soils

- Wetness of these altered soils has been increased by human activities (constructed wetlands, irrigation leaks, rice fields, lake skeins and other construction activities) or the soils have been altered by human activities (constructed wetlands, pond fringes and other excavations).
- These altered soils are hydric soils because they:
  - 1. Have a hydric soil indicator, or
  - 2. Meet hydric soil criteria 3 or 4, or
  - 3. By data meet the HSTS.

Drained (Protected) Hydric Soils

- This is the 2nd type of altered hydric soils: An attempt through human activities to decrease the wetness of these altered soils has been made (ditches, levees, dams, pumps, etc.).
- Even with reduced wetness these altered soils maintain their hydric status because they:
  - 1. Have a hydric soil indicator or,
  - 2. Meet hydric soil criteria 3 or 4 or,
  - 3. By data meet the HSTS.

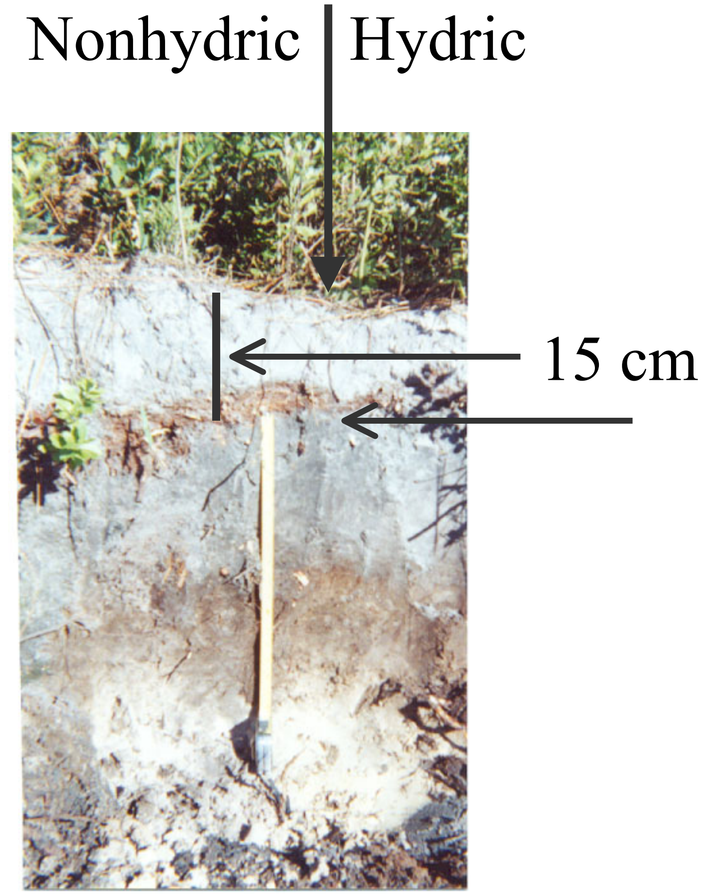
Drained Hydric soils

- The concept of drained hydric soils maintaining their hydric status should be thoroughly understood. This is important to wetland scientists. By recognizing a soil with a hydric soil indicator as being hydric regardless of hydrologic alteration we keep soils capable of supporting wetlands (if hydrology was restored) in the same class as soils that are currently supporting wetlands.
- There are areas in the lower Mississippi Delta that have been ditched, pumped, and protected by levees that are in crop production (soybeans) that are still not drained hydric soils because they still pond water for up to one month during the growing season, still have a hydric soil indicator, and still meet the HSTS. Overestimation of the effect of ditches and other drainage attempts is possible.

Historic Hydric Soils

- This is the 3rd type of altered hydric soils: These altered soils have had additional soil material placed on top of the original soil by human activities to the extent that that they are no longer hydric (1993 flooding deposition on the Missouri River flood plain, filling a wetland). The additions may be intentional (illegal fill) or non intentional (erosional deposition).
- These altered soils are nonhydric because they:
  - 1. Do not have a hydric soil indicator and,
  - 2. Do not meet hydric soil criteria 3 or 4 and,
  - 3. Do not, by data, meet the HSTS.

Historic Hydric Soils are altered soils that were once hydric but have had human modifications (additions) such that they are no longer hydric. The additions may be intentional (illegal fill) or non intentional (erosional deposition).



Historic Hydric Soils

- Even though fill material has been placed over the entire soil area shown in the previous slide it has areas that are still hydric as well as areas that are no longer hydric. The area to the right of the vertical arrow is still hydric even though fill material has been placed on the surface: it has the HS Indicator S6 (Stripped Matrix) starting within 15 cm (6 inches) of the surface. The lower horizontal arrow indicated where the stripped matrix starts. The soil area to the left of the vertical arrow still has a stripped matrix but it starts below the depth required (15 cm) by the HS Indicator S6 (Stripped Matrix).

Historic Hydric or Still Hydric?

Historic?

- The soil in the previous slide has had fill material placed over the original soil. The knife blade points to the limit of the 10YR 5/4 fill material (24 cm). The arrow points to the start of HS indicator F3, Depleted Matrix (28 cm). This "new" soil is nonhydric because the depleted matrix does not start within 25 cm and because the fill material has a chroma of 4. This is a Historic Hydric Soil.

Relict Hydric Soils

- This is the 4th type of altered hydric soils: These altered soils were once hydric but are no longer hydric due to geologic activities (pimple mounds of Texas Gulf Coast Prairie, stream downcutting).
- Only on close examination is it evident that hydric soil morphologies do not exist.
- These altered soils are nonhydric because they:
  - 1. Do not have a hydric soil indicator and,
  - 2. Do not meet hydric soil criteria 3 or 4 and,
  - 3. Do not, by data, meet the HSTS.

Relict Hydric Soils

- Several morphological characteristics can suggest relict redoximorphic features (Vepraskas, 1994). These are:
  - 1. Feature type and boundary characteristics,
  - 2. Location to macropores,
  - 3. Redox feature color, and
  - 4. Pore lining continuity.

1. Feature and Boundary Characteristics

- A. Nodules and nodules and concretions:
- B. Other redox concretions.

1 A: Nodules and Concretions Feature and Boundary Characteristics

- Contemporary nodules and concretions have:
  - 1. Diffuse boundaries (the color grade is commonly more than 2 mm wide),
  - 2. Irregular surfaces, and
  - 3. If smooth and round surfaces, red to yellow corona (halos) should be present.
- Relict nodules and concretions may have:
  - 1. Sharp boundaries (color grade is commonly less than 0.1 mm wide) and
  - 2. Smooth surfaces.

Relict Features

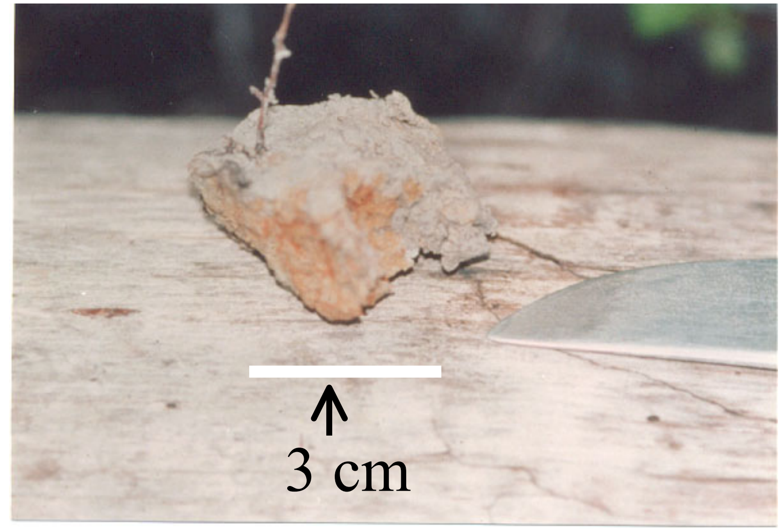
These redoximorphic features (nodules) most likely are relict because they have sharp boundaries and smooth surfaces.
(photograph Vepraskas. 1994)

1 B: Other Redox Concentrations Feature and Boundary Characteristics

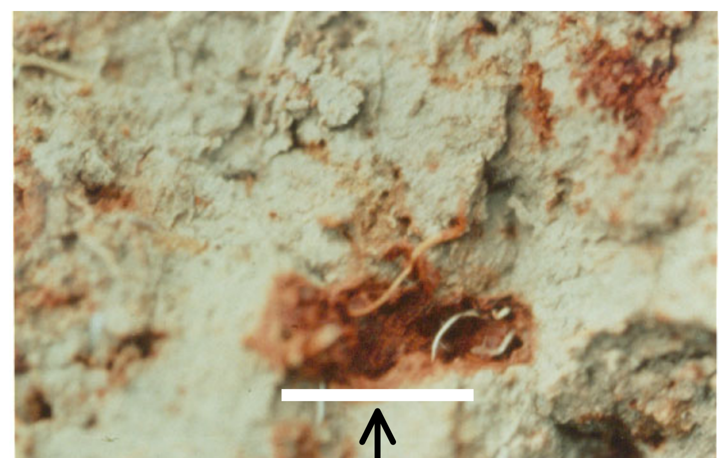
- Contemporary redox concentrations have diffuse boundaries.

- Relict redox concentrations may have sharp boundaries.

Contemporary redox concentrations have diffuse boundaries.



Relict redox concentrations may have sharp boundaries.



1 cm

2: Redox Macropore Features

- Contemporary macropores may have:
  - Fe depletions along stable macropores in which roots repeatedly grow that are not overlain by iron rich coatings.
- Relict macropores may have:
  - Fe depletions along stable macropores in which roots repeatedly grow that are overlain by iron rich coatings.

3: Redox Color Features

- Contemporary redox colors may be the results of the iron minerals:
  - 1. Ferrihydrite (5YR), Lepidiocrocite (7.5YR), Goethite (7.5YR, 10YR), and Jarosite (2.5Y) and
  - 2. Have value and chroma 4 or more.
- Relict redox colors may be the results of the iron mineral:
  - 1. Hematite (10R, 5R, 2.5YR) and
  - 2. Have value and chroma <4.

4: Pore Lining Continuity

- Contemporary pore linings may be continuous especially around living roots. Relict pore linings may be broken and unrelated to live roots.
- Pictured below is a continuous pore lining (reddish area) parallel to a reduced area (blue-green). Photograph by M. Stenzel, National Geographic. 1998, No. 4, p.125.

Summary

- The types of Altered Hydric Soils are Artificial, Drained (Protected), Historic, and Relict hydric soil. Artificial hydric soils were once nonhydric but now are hydric soils: created by human modifications to hydrology (additional water) or soil (removal of soil). Drained hydric soils were hydric and still are hydric soils: created by human modifications to hydrology. Historic hydric soils were once hydric but are now nonhydric soils: created by geologic or human modifications to soils (additions). Relict hydric soils were hydric but are now nonhydric soils: created by geologic modifications to hydrology.
- A soil is hydric because it: (1) Has a hydric soil indicator or, (2) Meets hydric soil criteria 3 or 4 or, (3) By data meets the HSTS.

Caveats

- Modified soil and hydrology may be due to illegal or legal activities.
- By federal or state agency policy, modified areas may be subject to litigation (Section 404 CWA, FSA Swampbuster) or still eligible for programs (USDA's EWP).

Literature Cited

- Hurt, G.W., P.M. Whited, and R.F. Pringle (Eds.). 2003. Field indicators of hydric soils in the United States (Version 5.01), USDA, NRCS, Fort Worth, TX. http://soils.usda.gov/soil_use/hydric/field_ind.pdf
- Vepraskas, M. J. 1994. Redoximorphic Features for Identifying Aquic Conditions. Tech. Bulletin 301. North Carolina Ag. Research Service, North Carolina State Univ., Raleigh, North Carolina.